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AP-913 Industry Capabilities Gap Analysis Results

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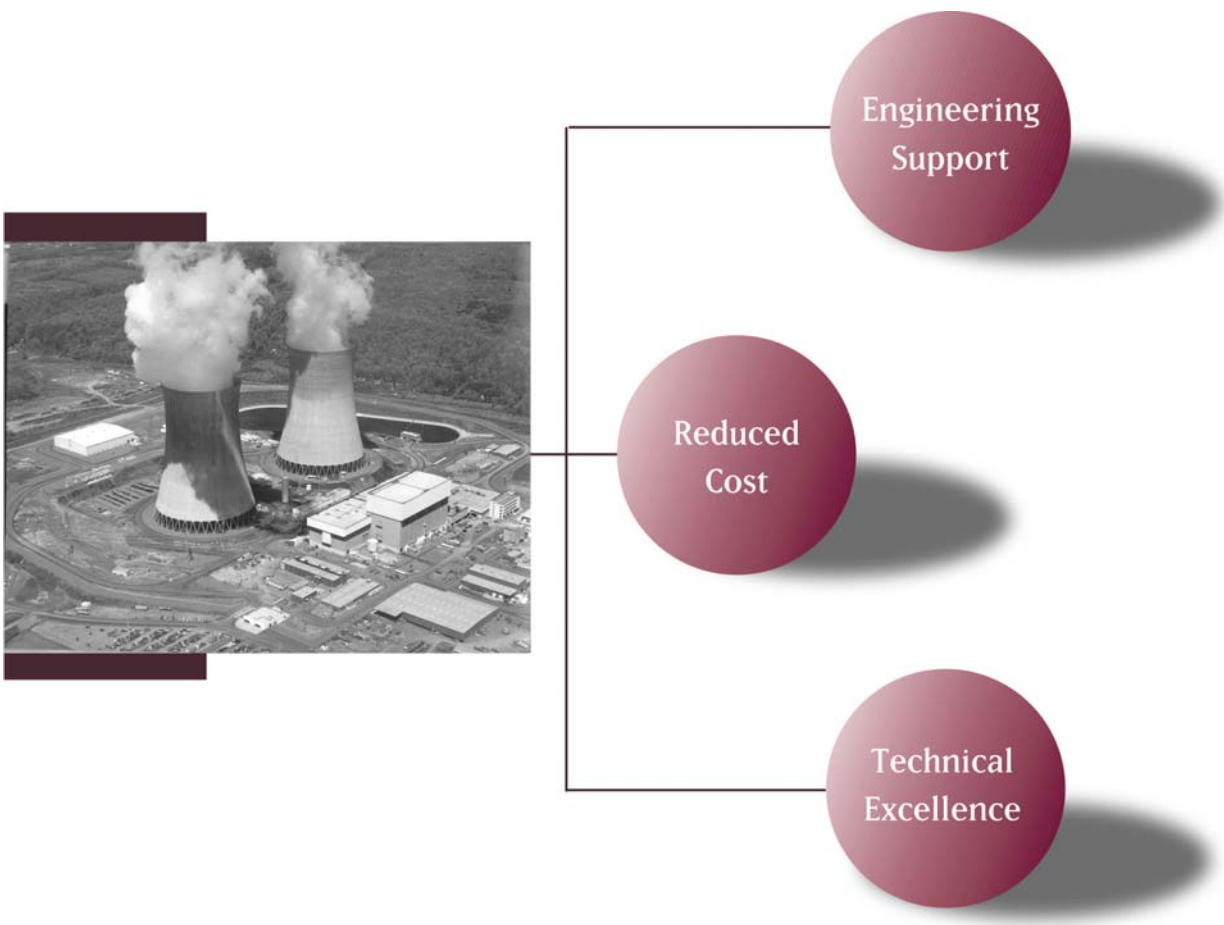

PLANT SUPPORT ENGINEERING

AP-913 Industry Capabilities Gap Analysis Results

1003478

Technical Update, December 2002

EPRI Project Manager

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CITATIONS

This document was prepared by

Electric Power Research Institute
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Charlotte, NC 28262

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This document describes research sponsored by EPRI.

The publication is a corporate document that should be cited in the literature in the following manner:

AP-913 Industry Capabilities Gap Analysis Results, EPRI, Palo Alto, CA : 2002. 1003478.

ACKNOWLEDGEMENTS

The author would like to express thanks to those individuals responsible for the information resources that were used in the preparation of the industry capabilities gap analysis.

The Equipment Reliability Benchmarking Task Force led by Matt Sunseri, TXU Energy

Information contributors to the AP-913 Support Information (Database):
Ike Ezekoye, Westinghouse
Vince Gilbert, NEI
Tom Green, General Electric
Susan Korn, Altran
Larry Lesniak, Framatome-ANP

Participants in the Equipment Reliability Process Case Studies:
Joe DeMarco, Dominion Nuclear Surry
Phil Flesch, Altran
Jeff Goldman, Exelon
Dave Gullott, Altran
Ken Hart, PP&L Susquehanna
Susan Korn, Altran

Organizers of the NEI Benchmarking Project Workshop and EPRI Equipment Reliability Forum:
Leigh Aparicio, EPRI
Marty Bridges, EPRI
Vince Gilbert, NEI
Tonya Holt, EPRI
Mark Hooker, ABE
Steve Nichols, INPO
Kim Shear, NEI
Matt Sunseri, TXU Energy

An additional expression of special thanks goes to Vince Roppel, INPO, for his several years of dedication to the Equipment Reliability Process now successfully being applied by many nuclear power plants.

ABSTRACT

As Equipment Reliability (ER) becomes a focus at many U.S. nuclear facilities, INPO's report, AP-913 "Equipment Reliability Process Description", is the blueprint that many plants are adopting to implement as their ER process. AP-913 divides the ER process into six areas, each with a number of subordinate elements. These process areas span many departments and disciplines.

This report chronicles an industry-wide gap analysis performed to address plant equipment reliability information resources, plant performance, and potential process improvements. For the purpose of this report, there are three types of gaps identified:

- Information Gap
- Performance Gap
- Process Improvement Opportunity

Information gaps are associated with process areas with less than desired technical information or tools to support its implementation. Performance gaps are areas that have less than desired performance. Process improvement opportunities are specific enhancements that may improve a process element.

The report draws on several information sources to identify the process gaps. These other data sources include:

- ER Benchmarking Project
- Industry AP-913 Support Information Database
- ER Process Case Studies
- ER Benchmarking Project Workshop and ER Forum

After the gaps are identified, their causes are identified, and recommendations are made to address or better understand these gaps.

CONTENTS

1

SUMMARY

A gap analysis addressing plant equipment reliability information resources, plant performance and potential process improvement was conducted. The reference for the analysis was INPO's document AP-913 "Equipment Reliability Process Description". The gap analysis identified potential actions in the following areas:

- Identification of Critical Components (Process Improvement Opportunity)
- Continuing ER Improvement Process Clarification (Process Improvement Opportunity)
- Identification and Management of Aging Issues (Performance and Information)
- Identification and Management of Obsolescence Issues (Performance and Information)
- Integration of ER Planning with Plant Business Plans (Performance and Information)
- Interface of Long-Term Planning with other ER Processes (Process Improvement Opportunity, Information)
- Effective Interfaces between ER Process Elements (Process Improvement Opportunity, Information)
- Process Performance Indicators (Information)
- Equipment Reliability Data (Information)

The recommendations include a combination of both specific focused actions to address identified gaps and actions to better understand the gaps.

2

BACKGROUND

As the industry increases its recognition of the economic importance of dependable nuclear generation, greater emphasis has been placed on equipment reliability. INPO's document AP-913 "Equipment Reliability Process Description" (ER Process) has become the industry guidance "blueprint" for achieving improved reliability. The ER Process encompasses a large number of plant activities. To implement the guidance contained in the ER Process a variety of more detailed capabilities than that outlined in the ER Process are needed. These capabilities support activities across a number of plant functions.

Some of the primary capabilities that support implementation of the ER Process are referenced in the ER Process document, AP-913, however due to the large number of potentially applicable references not all are. In 2001 INPO and EPRI collaborated to mutually identify pertinent ER references and to support electronic connection to these references from each organization's web sites. In support of this collaboration EPRI prepared a comprehensive listing of all EPRI reference materials published through December 2001 that support implementation of the ER Process. This listing is available on EPRI's web site:
http://www.epriweb.com/epriweb2.5/ecd/np/equip-reliability/index.html.
For the user's convenience it is organized according to the ER Process major areas and subordinate activities. In addition to the listing's value in locating ER Process technical support information, it has also been utilized by EPRI's staff and utility advisors to identify gaps. A gap was defined as a situation in which there is insufficient EPRI technical support information associated with an ER Process area or subordinate element.

In 2002 the concept of identifying gaps between ER Process areas or subordinate elements and technical support information was extended to encompass ER Process technical support information beyond EPRI references. Additionally the definition of a gap was expanded to include areas where industry performance has been found to be less than desired, and areas where improvement opportunities have been identified. As a result, the following gap types are used in this report: information gap, performance gap, and process improvement opportunity.

The purpose of this document is to describe the extension of the gap analysis activity and provide action recommendations to address the gaps where appropriate.

3

INFORMATION RESOURCE DESCRIPTIONS

As discussed in the Background section of this report additional information was obtained to augment EPRI information that supports implementation of the ER Process. The additional information resources utilized consist of:

- ER Benchmarking Project
- Industry AP-913 Support Information (Database)
- ER Process Case Studies
- ER Benchmarking Project Workshop and ER Forum

Each of these is described in the following sections.

ER Benchmarking Project

In 2002 NEI organized a benchmarking project addressing equipment reliability. INPO and EPRI supported the organization of the project, in particular the benchmarking project focus. The benchmarking focused on several areas within the ER Process perceived to be areas where performance of the ER Process was less advanced than others. By focusing on the less advanced areas it was anticipated that good practices might be identified at the benchmarked plants that would provide new information useful to the industry. The benchmarking project was led and staffed largely by utility personnel producing a published report, "Equipment Reliability Benchmarking Report", in the second half of 2002. Good practices and other useful insights from this project have been utilized in the gap analysis.

Industry AP-913 Support Information Database

As discussed in the paragraph above, the ER Benchmarking Project focused on areas perceived to be less advanced with the intention of discovering new information that would be useful to the industry. It was judged that information was available, relatively well understood, and in many cases in practice to support the implementation of AP-913 for areas not focused on during the ER Benchmarking Project. Because the assumptions related to the availability of information in the areas perceived to be more advanced were questioned by a number of the ER Benchmarking Project utility participants an effort was undertaken by EPRI to identify industry information available to support implementation of the ER Process. This information included areas perceived to be more advanced, to address the utility participants questions, and those less advanced if such information was found. This information was collected into a database and includes the EPRI information discussed in the Background section of this report. Information previously identified by INPO based on their industry wide activities as well as site specific activities, and information from the three U.S. NSSS Owners Groups (including some information from the NSSS "parent" organizations) – Westinghouse / Combustion Engineering, BWR - General Electric and Babcock & Wilcox. The database will be distributed to EPRI members and database participants in early 2003. The information contained in this database has been used in the gap analysis to determine what ER Process areas and subordinate elements have documented references to support their implementation.

ER Process Case Studies

ER Process implementation case studies were performed as part of an EPRI project in 2002. The case studies were conducted in response to inquiries by utility participants attending two meetings in 2001, the INPO - Life Cycle Management Meeting and the INPO – Performance Monitoring Meeting, related to "How to implement the ER Process?" At these meetings INPO and EPRI accepted an action to address these inquiries and later concluded a one "right" approach was not realistic and case studies documenting the experience of several organizations would be most worthwhile. These studies chronicle the ER Process implementation experience of three organizations that have expended effort on this over the last several years. The studies also characterize common characteristics of their experience. The three organizations were: Exelon Nuclear, PP&L - Susquehanna and Dominion Generation – Surry. The case studies are published in EPRI Report 1003479 "Equipment Reliability Case Studies – INPO AP-913 Equipment Reliability Process Implementation". Although these studies focus on implementation experience, insights based on areas where the case study participants have indicated benefit will be derived from further effort have been used in the gap analysis.

ER Benchmarking Project Workshop and ER Forum

Following the completion of a benchmarking project organized by NEI it is customary to hold a workshop to review the project results with the industry. In December 2002 a workshop to review the ER Benchmarking Project was held in conjunction with the ER Forum conducted in December 2002. The ER Forum is a meeting sponsored by EPRI that brings together the multiple plant functional disciplines (engineering, maintenance, management, etc.) important to the ER Process. The content of this ER Forum was intentionally structured to complement the Benchmarking Project Workshop (both initiation and completion) reaching to additional levels of detail through parallel path technical sessions. In addition in 2002 the November – December INPO meeting on Life Cycle Management and Aging was incorporated as part of the Forum. These combined events provided a valuable opportunity for participants to discuss their reactions to the ER Benchmarking Project results in breakout sessions and share their experiences on a more detailed technical level during the ER Forum. The results of the Workshop breakout sessions and the Forum technical discussions have been applied to augment the gap information developed from the resources discussed above. During the ER Benchmarking Workshop and the ER Forum the formation of a Community of Practice (CoP) was discussed. The CoP would function to:

- Support improvement of the ER Process
- Facilitate use of the ER Process to improve plants' ER results
- Incorporate the use of financial data to further optimize the use of the process

The concept of a CoP was endorsed by the attendees and will focus in the next six months (January 2003 – June 2003) on developing basic functional elements including a charter, participants, near term goals and activities. Additionally recent INPO and EPRI reorganization activities were discussed that will place more emphasis on ER as a focused activity.

4

GAP SUMMARIES

When the project to prepare the gap analysis discussed in this report was introduced the concept of a gap was considered to be an ER Process area or subordinate element that did not have technical information or tools that adequately supported its implementation. As discussed earlier, this definition was expanded to also include apparent gaps associated with less than desired industry performance and opportunities for improvement of the process. As a result of understandings obtained from the Benchmarking Project and the Case Studies, the importance of the flow of information and interactions between the ER Process areas and subordinate elements became apparent as a major contributor to successful functioning of the ER Process. Consequentially consideration has been given to process interfaces as well as process elements. The following set of gap possibilities is included in this analysis:

Gap Types

- Information Gap
- Performance Gap
- Process Improvement Opportunity

ER Benchmarking Project Based Gaps

As discussed previously the benchmarking focused on several areas within the ER Process perceived to be areas where performance of the ER Process was less advanced than others with the intention of discovering new information that would be useful to the industry. The resulting project report was successful in several areas in identifying this information and includes it as good practices or common contributors to ER Process performance success. Although the resulting project report does not directly address gap areas the results point to these areas in which few or no good practices or common contributors to success were found. In August 2002 the Benchmarking Project was presented at the EPRI Advisory Committee meeting by Matt Sunseri, TXU – Comanche Peak, who was the project leader. Contained within the presentation was a table that summarizes key project findings. The table is reproduced in Table 4-1:

Table 4-1
ER Benchmarking Project Results Summary Table

Areas	Good Practices	Common Contributors	Weak Areas
Process Performance Indicators	1		X
Like Component Trending	2		
Critical Component Identification	2	X	
Integration with Business Plan	1		X
Equipment Issue Prioritization	0	X (a)	
Use of As-Found Equipment Condition Information	0 (b)		
Identification and Management of Aging and Obsolescence Issues	1		X
Equipment Reliability Process Interfaces	0	X (a)	
Other	2		

(a) Although no specific good practices were identified all of the plants visited were observed to have positive characteristics in these areas that contributed to the success of their equipment reliability process.
(b) Several plants with effective practices made presentations at the May 2002 Equipment Reliability Forum.

The weak areas identified above represent potential gaps discovered as a result of the Benchmarking Project. Most plants benchmarked had not considered performance indicators to address intra-process performance. Generally where performance indicators had been considered it addressed ER Process output that may support overall measurement of results but does not support diagnostics to help in improving the functioning of the ER Process. Integration with Business Plan was generally not well defined (a contributor to this may be the narrow focus of the plants' Long-Term Planning, discussed in a subsequent paragraph). Evidence of organized, proactive efforts to address aging and obsolescence was not typical and the one good practice identified was focused in one technical area and was in response to unacceptable plant performance that had impacted production.

Observed during benchmarking visits was a very narrow approach applied in the plants' Long-Term Planning activities. The approach tended to focus on pre-defined capital projects, generally major modifications, and evidence of a multi-faceted approach (input on a variety of solution possibilities from multiple plant functions) was not typically evident. Although there were some exceptions, Long-Term Planning appeared to be disconnected from the remainder of the plants' ER Processes and disadvantaged due to limited input to the activity.

In addition to the information in the prior table related to gaps associated with ER Process areas and subordinate elements potential improvements to the content of the ER Process provided during benchmarking visits included:

1. Incorporation of an optional "graded approach" by developing subcategories of critical components. Utilization of risk as an option in identifying critical components.
2. Clarification of the intent of the ER Process area "Continuing Equipment Reliability Improvement". The flowchart within this Process area suggests prioritization of effort as, preventive maintenance (PM) actions first followed by consideration of configuration (including operational procedures) and design changes. An integrated consideration of the several change possibilities is a suggested clarification, possibly similar to that included in Long-Term Planning & Life Cycle Management – Develop/Update System/Component Long-Term Health Strategy.

Industry AP-913 Support Information Database Gaps

The Industry AP-913 Support Information database contains over 500 references associated with the six ER Process areas and over three-dozen subordinate elements. Since each ER Process area's scope varies and all references contained within the database may not be equally valuable the tabulation below was developed to provide a first order measure of the information available for each ER Process area and the scope of that area. The number of INPO cited references obtained from within the ER Process document and from other relevant INPO references are included as a separate entry under the assumption that these would reasonably have high applicability to the ER Process.

Table 4-2
ER Process and Support Information Database Reference Summary Table

ER Process Area	Activity Elements	Decision Elements	Interfacing Process Elements	Input Elements And Paths	Output Elements and Paths	References in the Database	INPO Cited References in the Database
Scoping and Identification of Critical Components	2	2	0	1	4	327	3
Performance Monitoring	3	1	0	5	3	95	4
Corrective Action	2	2	2	2	2	81	3
Continuing Equipment Reliability Improvement	4	8	2	3	6	226	7
Long-Term Planning & Life Cycle Management	4	1	1	5	0	111	4
PM Implementation	1	1	4	2	1	40	3

Table 4-3
ER Process and Support Information Comparison Statistics Table

ER Process Area	Scope of Area Measure(a)	References in the Database	INPO Cited References in the Database	References in the Database per Scope of Area Measure	INPO Cited References in the Database per Scope of Area Measure
Scoping and Identification of Critical Components	9	27	3	3	.3
Performance Monitoring	12	95	4	8	.3
Corrective Action	10	81	3	8	.3
Continuing Equipment Reliability Improvement	23	226	7	10	.3
Long-Term Planning & Life Cycle Management	11	111	4	10	.4
PM Implementation	9	40	3	4	.3

(a)As a measure of the technical support information available per ER Process area the number of references in the database was compared to the scope the area. The scope of the area was estimated by computing the sum of the activity, decision, interfacing process, input and output entries in the preceding summary table.

The prior two tables provide rough measures for assessing the scope contained within each area and the extent of technical support identified for each area. From the roughly derived statistics above it can be deduced that the area of largest scope is – "Continuing Equipment Reliability Improvement" – which would also be obvious by inspection of the physical space this process area covers on the process flow chart. One could also deduce that the process areas "Scoping and Identification of Critical Components" and "PM Implementation" have the smallest portion of references based on total references and scope size. Using the INPO cited references only, the portion of references as a function of scope of the area is roughly the same for all ER Process areas. Although the INPO cited references in the database may have more relevance to the ER process it should be noted that AP-913 was last revised in 2001. Subsequent revisions would be expected to contain additional references that may be available today.

ER Process Case Studies

When the ER Process implementation case studies for the three organizations were chronicled some common themes became apparent. Although some of these are discussed within the ER Process document and other related material such as INPO's November 2000 Executive Letter on "Common Success Factors" several appear to be relatively new insights obtained based upon experience. The common themes that contributed to success which were derived from the case studies were:

1. Management belief in ER (recognition of value)
2. Management dedication of resources (quality people, time, budget)
3. Initiated as a Project; transition to a Process
4. Personal focus on "as-found" (conditions)
5. Modest re-organization

6. Software purchase/modification
7. Recognition of tie to financial success
8. Equipment performance monitoring

The organizations included in the case studies were chosen in part because they have worked on implementing the ER Process more extensively than a "typical plant". The themes listed above appear to be instrumental in their putting in place the ER Process.

Although these studies focus on implementation experience, insights based on items where the case study participants have indicated benefit will be derived from further effort can be applied to an industry gap analysis. The items identified in the case studies that fell into this category included:

1. Process Performance Indicators
2. Long Term Planning
3. Business Plan

Since the application of the ER Process is relatively new in the industry it is not surprising that the items cited above were identified. These items represent the areas that are typically "worked" once the fundamentals of a process are in place:

- Overall performance monitoring (Is the process yielding valued results?)
- Process performance indicators (What should I work on to improve the process performance?)
- Long-term planning / integration with the business plan (Factoring equipment reliability issues into the long-term plan and integrating into the business plan.)

These items are also dependent on having the process in place and a desire to use a process optimization approach to achieving improvement. It is also safe to assume that these items would be typical of many plants – since the case study participants were chosen because they are among the organizations on the forefront in implementing the ER Process.

In addition to the case study common themes discussed previously two case study site observations are noteworthy as they reinforce results derived from the ER Benchmarking Project. The first observation is from the Surry case study and is related to the benchmarking process results related to critical component identification and equipment reliability process interfaces. Those most familiar with the ER Process often report that the most important ER Process element to accomplish is critical component identification because it "sets the stage" for all subsequent activities. Almost equally important is to insure that all plant activities utilize the same set of critical components. The Surry case study showed how this was accomplished by leveraging existing program information and how this now is utilized in their other ER Process activities (corrective action and PM).

The second observation is from the Susquehanna case study and is related to the benchmarking project results related to critical component identification and the recommendation to develop ER Process guidance related to incorporation of a "graded approach" (subcategories of critical components) associated with the ER Process area "Scoping and Identification of Critical Components". Susquehanna's case study discussed the use of a Component Importance Function that is based on a combination of Maintenance Rule and PRA results to determine six categories of components. These six categories encompass the "critical, non-critical, and run-to-failure" categories in the ER Process and are applied through incorporation in the plant equipment database and on all work orders.

ER Benchmarking Project Workshop and ER Forum

The content of the ER Benchmarking Project Workshop and the ER Forum significantly focused on the results of the Benchmarking Project and the Case Studies that were completed earlier in 2002. Consequentially deeper insights were obtained related to gaps previously identified during Benchmarking and new gaps or observations were identified during the meetings.

Further insight and understanding were obtained associated with the following:

- Integration of equipment reliability initiatives with long term funding plans (gap)
- Use of risk in the determination of critical components (gap)
- Opportunities for improvement of aging management capabilities (gap)
- Lack of intra-process performance indicators (gap)

An appreciation of the importance and issues with the following were also obtained:

- Lack of experience with equipment reliability overall process "output" measures or indicators (gap)
- Lack of systematically obtained equipment reliability data (gap)
- Importance of the role of IT support in implementing an effective equipment reliability process (observation)
- The significant impact that I&C component reliability has on system reliability and the need to integrate I&C expertise, involvement in equipment reliability activities (observation)

One of the challenges cited during the Workshop related to integrating equipment reliability initiatives with long term planning was the common practice at many plants of having firm funding commitments going forward only for the next year out in what may be a multi-year plan (such as the capital plan).

The interest in the use of risk as a consideration in the determination of critical components was expressed through presentations by utility staff in both the Workshop and the Forum.

An insight was gained related to the aging management gap identified in the ER Benchmarking project. It was suggested that although few plants may have a formalized "Aging Management Program" all plants have in place aging management activities that are embedded in other plant programs or responsibilities. The use of predictive maintenance diagnostics, root cause analysis and other activities were cited as examples. The value of identifying and collecting known aging management activities that plants should be addressing was expressed. A need for aging awareness training for craft level staff was identified as a means to expand the content of plant staff feedback on plant conditions. Although not discussed in detail similar issues and potential activities as related to obsolescence were discussed.

Intra-process performance indicators were discussed on several occasions during the Workshop and the Forum. Several plants have initiated measures to assess the overall performance "output" resulting from their work in implementing the ER process (as an example trending of critical component failures) but intra-process performance indicators were concluded to be still in a formative stage. Additionally application experience with overall process “output” indicators and the implementation of the ER Process were thought to be too recent to understand any observed trends. As an example at one site critical component failures were higher after implementation of several of the ER Process elements – but concluded to be a reflection of more accurate “measurement” rather than actual reduced reliability.

The value of systematically obtained equipment reliability data was demonstrated during the ER Forum during the keynote presentation by the Deputy Program Director for the Air Force’s B-52 bomber program. The B-52 Program benefits significantly from the ability to assess and project reliability data from the roughly 100 B-52 aircraft currently in service. In contrast the 100+ U.S. nuclear plants’ equipment reliability data sources are more limited, both by quantity of information and also consistency of the data between plant sources.

As was discovered in the Benchmarking Project the importance of effective IT support cannot be understated. Benefits cited included both improved information sources and also better use of staff resources.

Throughout the Workshop and the Forum there appeared to be a growing recognition of contribution that I&C and electrical equipment (power supplies, transformers, etc.) play in plant reliability concerns. It is also notable that most meeting attendees did not have electrical or I&C technical backgrounds

5

GAP SUMMARY

The gap summary consists of two parts. The first part is a collection of the gaps identified in the preceding sections of this report. The second part consists of potential action recommendations associated with the identified gaps.

The gaps identified in the preceding sections of the report are presented and described in the following table. The subsequent table presents the gaps identified and the source of the gap. In numerous cases the gaps were derived from several sources.

Table 5-1
Gap Description Table

Gap	Type of Gap	Gap Description
"Identification of Critical Component" Improvements	Process Improvement Opportunity	Incorporation of the optional use of critical component subcategories that are based on the extent of functional impact a component may have. Recognition of the use of risk as a consideration in determining critical components.
"Continuing ER Improvement" Process Clarification	Process Improvement Opportunity	Clarification of the implied sequence of strategy application. By virtue of the flow chart arrangement it is implied that PM adjustments have precedence over other strategies. A preferred approach may be to consider all strategies and then selecting one optimal for the specific situation.
Identification and Management of Aging	Information Gap and Performance Gap	Proactive aging activities are not readily apparent leading to concern that issues may not be addressed.
Identification and Management of Obsolescence	Information Gap and Performance Gap	Reactive (vs. proactive) responses to obsolescence issues are common.
Integration with Business Plan	Information Gap and Performance Gap	ER improvement needs are not effectively integrated into plant business plans.
Interface of Long-Term Planning with Other ER Processes	Information Gap and Process Improvement Opportunity	Long term planning, typically only capital projects, is not a cross plant, cross-functional activity benefiting from the results of other ER process activities.
Effective Interfaces Between ER Process Elements	Information Gap and Process Improvement Opportunity	Implementing the ER process in the presence of established procedures and precedence requires more than the transfer of information, it requires the integration of the information, adjustment or customization of the information.
Process Performance Indicators	Information Gap	Process performance indicators for the ER process do not exist. Process implementation and functional improvements are difficult to diagnose without effective indicators.
Equipment Reliability Data	Information Gap	Failure data currently available does not support some reliability evaluation processes.

Table 5-2
Gap Source Table

Gap	ER Benchmarking Project	Industry AP-913 Support Information (Database)	ER Process Implementation Case Studies	ER Benchmarking Project Workshop
"Identification of Critical Component" Potential Improvements - Graded Critical Component Levels, Use of Risk Considerations	X	X	X	X
"Continuing ER Improvement" Process Clarification – Sequence of Implied Improvement Strategy	X			
Identification and Management of Aging	X			X
Identification and Management of Obsolescence	X			X
Integration with Business Plan	X		X	X
Interface of Long-Term Planning with Other ER Processes	X		X	X
Interfaces Between ER Process Elements	X		X	X
Process Performance Indicators	X		X	X
Equipment Reliability Data				X

6

GAP CAUSES AND RECOMMENDATIONS

To develop recommendations to address the gaps outlined previously a two-step process was utilized. The first step consisted of assessing the cause of the gap based on the information available from the information resources used to derive the gaps. The gap causes identified here were based largely on insights obtained from the Benchmarking Project, the Case Studies, and the NEI Benchmarking Workshop / ER Forum sessions. The gap causes are contained in the following table. In several cases fairly clear insights were obtained that allowed succinct definition of the causes of the gaps. In some cases the confidence associated with the cause for the gap is not strong and therefore further activities are needed to better understand the cause of the gap. Based on the gap causes and the confidence associated with the causes potential actions were developed and are summarized in the subsequent table. Both the Gap Causes and the Gap Recommendations are further discussed following the tables summarizing the causes and recommendations.

Table 6-1
Gap Cause Summary Table

Gap	Type of Gap	Gap Cause Summary
"Identification of Critical Component" Improvements	Improvement Opportunity	Improvement opportunity resulting from better process understating.
"Continuing ER Improvement" Process Clarification	Improvement Opportunity	Process improvement opportunity resulting from better process understating.
Identification and Management of Aging	Information Gap and Performance Gap	Information integration and awareness lacking.
Identification and Management of Obsolescence	Performance Gap	Prioritized, focused approach.
Integration with Business Plan	Performance and Information Gap	The understanding of the cause for this gap may be lacking.
Interface of Long-Term Planning with Other ER Processes	Performance Gap	The understanding of the cause for this gap may be lacking.
Effective Interfaces Between ER Process Elements	Improvement Opportunity, Information Gap	ER process application is not mature throughout the industry.
Process Performance Indicators	Information Gap	ER process application is not mature enough to support experience in the use of process performance indicators.
Equipment Reliability Data	Information Gap	The understanding of the implications associated with this gap may be lacking.

Discussion of Gap Causes

"Identification of Critical Component" Improvements

This is a success item, an improvement opportunity resulting from better process understating. Advancement in the understanding of the process element has identified an opportunity to improve current process guidance. Introduction of risk informed considerations have been utilized at several plants, as has been a "graded approach" within critical and non-critical component identification. Incorporation of these considerations as optional approaches as a reference in AP-913 or as guidance information will support utilization by other plants interested in these approaches.

"Continuing ER Improvement" Process Clarification

This is another success item, an improvement opportunity resulting from better process understating. In the "Continuing ER Improvement" area the opportunity for near term advancement through utilization of all of the element activities may be possible rather than a strict sequential following of the element steps.

Identification and Management of Aging

Activities to address aging are necessarily dispersed throughout multiple plant functions. Implementation of appropriate actions for known issues is difficult to verify and track. Effective strategies for maintaining vigilance for emergent issues are also a challenge.

Identification and Management of Obsolescence

"Stopgap / heroic" solutions have been successful in reactively solving many high visibility obsolescence issues thus diluting emphasis on more proactive approaches. The large number of obsolescence situations makes an "across the front" proactive approach difficult. Prioritization and focused efforts are clearly implied.

Integration with Business Plan

The cause for this gap may be lacking. It appears that many plant goals and staff efforts are focused on near term issues and plant performance that dominate attention and focus of efforts.

Interface of Long-Term Planning with Other ER Processes

The cause for this gap may be lacking. It appears that in many cases long-term planning activities are stand-alone functions handed the responsibility of "fixing the problem" (design modifications and capital projects). Once handed the task of "fixing the problem" a cross section of plant staff may not be involved in the identification of solution possibilities. Additionally it appears that proactive long-term planning functions may not directly involve and integrate key plant staff inputs.

Effective Interfaces Between ER Process Elements

The ER process application is not mature throughout the industry. The benefits of process interface relationships are not fully understood nor appreciated.

Process Performance Indicators

The ER process application is not mature enough to currently support experience in the use of process performance indicators. Efforts at some lead plants have been initiated but significant experience has not been obtained.

Equipment Reliability Data

Current data largely addresses safety significant equipment reliability issues. Consistency of data between plant sources has been a concern. The implications of these shortcomings to successful applications could benefit from better definition.

Discussion of Gap Recommendations

Table 6-2
Gap Action Recommendation Table

Gap	Type of Gap	Gap Action Summary
"Identification of Critical Component" Improvements	Improvement Opportunity	Industry consensus guidance paper to be incorporated into or referenced by AP-913.
"Continuing ER Improvement" Process Clarification	Improvement Opportunity	Clarification information to be incorporated into or referenced by AP-913.
Identification and Management of Aging	Information Gap and Performance Gap	Aging issues "checklist" and awareness training.
Identification and Management of Obsolescence	Performance Gap	Case study examples of benefits of proactive approaches.
Integration with Business Plan	Performance and Information Gap	Case study examples.
Interface of Long-Term Planning with Other ER Processes	Performance Gap	Case study examples.
Effective Interfaces Between ER Process Elements	Improvement Opportunity, Information Gap	Case study examples.
Process Performance Indicators	Information Gap (Interface)	Pilot applications.
Equipment Reliability Data	Information Gap	Better understanding of applications and needs.

"Identification of Critical Component" Improvements

An industry consensus guidance paper addressing the use of deterministic and risk informed criteria for the identification of critical components could effectively augment current AP-913 guidance. Use of risk informed criteria would be an optional addition determined by individual plants. Plants have begun the incorporation of this into their approaches. Formal recognition of this through reference by AP-913 would support its consistent use. Included in the guidance paper could be examples of the use of graded component classification approaches, also an optional addition determined by individual plants.

"Continuing ER Improvement" Process Clarification

Clarification of the intent of the ER Process through examples of approaches used to implement the "Continuing ER Improvement" element could be added to the AP-913 references. The clarification could include examples of situations where all the activities in the "Continuing ER Improvement" element are not approached sequentially but are considered in total resulting in the optimal solution based on consideration of multiple possible solutions. Current AP-913 guidance focuses first on PM activities and provides a logical solution path that is most likely applicable to many plants but may not be as effective for those plants with strengths and flexibility in other areas (engineering, operations).

Identification and Management of Aging

Aging management was identified as a significant gap resulting from the Benchmarking project. During the Benchmarking project workshop session on aging it was strongly suggested by plant participants that many aging activities are in place but they may not have been visible in the benchmarking and further that a comprehensive collection of known and understood issues and associated activities would benefit plants by allowing them to "check list" their coverage of these considerations. Additionally the awareness of aging issues at the craft level was pointed out as a beneficial area that would augment the maintenance feedback element in the ER Process. Collection and documentation of known aging issues for use by plants to verify appropriate actions ("checklist") should be put in place. Aging awareness training applicable to plant technical staff and craft should be developed and applied.

Identification and Management of Obsolescence

Collection and documentation of examples of successful plant experiences in prioritizing and addressing obsolescence issues utilizing industry approaches such as those contained in NUOG's guidance material.

Integration with Business Plan

Development of case studies documenting successful plant experiences in integrating ER needs with plant business plans as outlined in AP-913 would result in a better understanding of how this has been successfully achieved and has been effective as tested by actual utility experience. A longer-term industry Community of Practice effort in this area may be most appropriate.

Interface of Long-Term Planning with Other ER Processes

Expansion of the ER Benchmarking project report and Case Study report information to include the benefits realized by plants that have effectively interfaced long-term planning with other ER process elements would support plants understanding of how this gap can be addressed.

Effective Interfaces Between ER Process Elements

Expansion of Case Study report examples containing the identification of methods developed by plants to facilitate information flow between process elements (such as incorporation of critical component identification information to performance monitoring, continuing ER improvement, corrective action, etc.) would serve to support effective use of the ER Process.

Process Performance Indicators

Formation of candidate process indicators and piloting use at several plants would serve to initiate the use of indicators and explore their usefulness. A longer-term industry Community of Practice effort in this area may be appropriate.

Equipment Reliability Data

Better understand the applications of additional equipment reliability data and the benefits of augmenting the current information sources. Incorporate INPO plans to advance their plant analysis activities. Augment data acquisition and follow on information to maximize benefits associated with use of the information.

7
REFERENCES

1. INPO AP-913 “Equipment Reliability Process Description”, November 2001.
2. NEI Equipment Reliability Benchmarking Project Report, September 2002.
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4. NEI Equipment Reliability Benchmarking Workshop and EPRI Equipment Reliability Forum, December 2002.

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